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# GLAST Observatory Overview

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## GS SDR Section 5



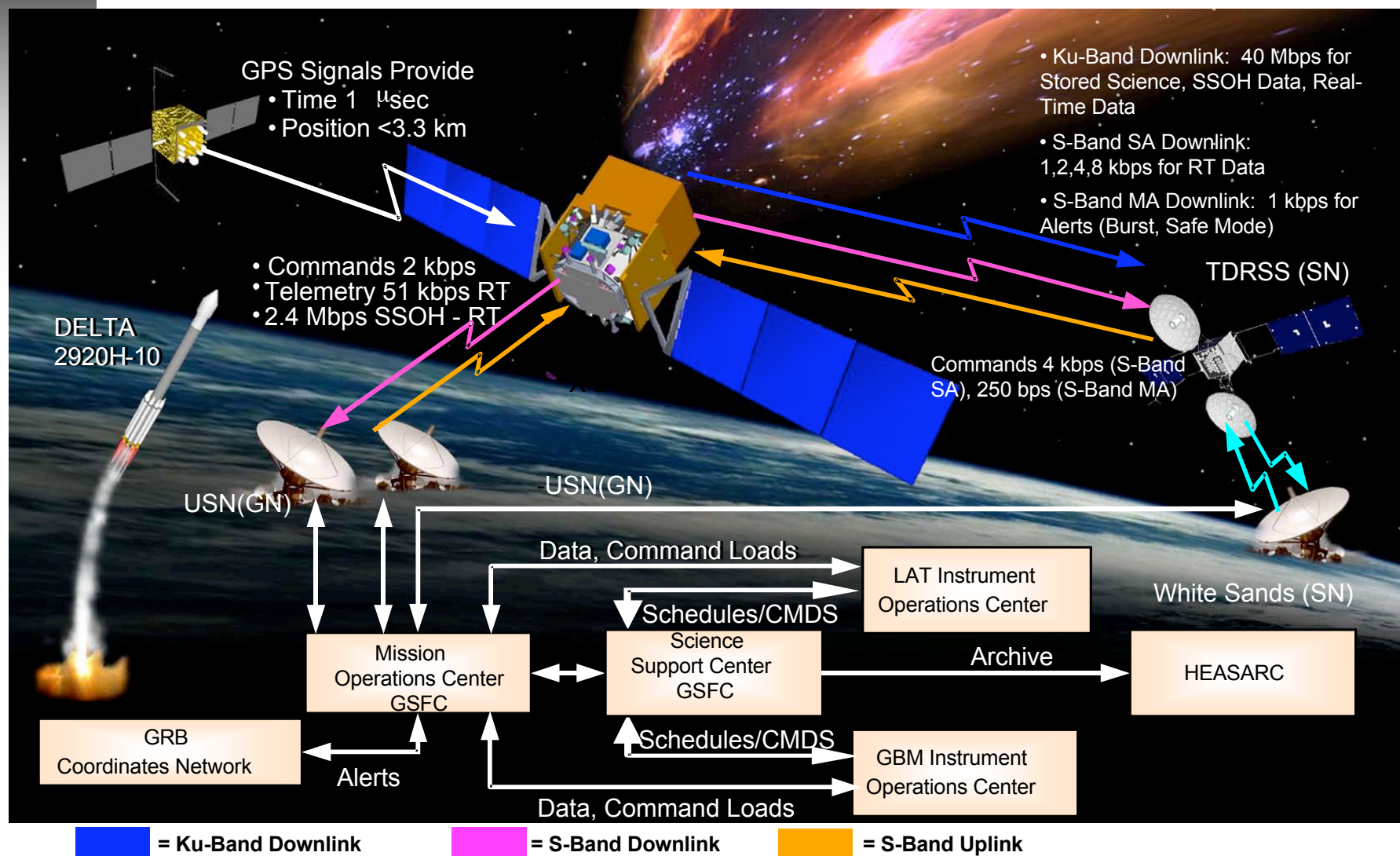
# GLAST Mission Overview

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- ▶ ***GLAST: Gamma-Ray Large Area Space Telescope***
- ▶ ***Objective: Measure Direction, Energy, and Arrival Time of High Energy Photons With Energy From 5 KeV to Greater Than 300 GeV. Rapid Gamma Ray Burst Timing & Location***
- ▶ ***Instruments: LAT and GBM***
- ▶ ***Mission Duration: 5 Yrs (10 Yr Goal)***
- ▶ ***Orbit: 565 Km Circular, 28.5° Inclination***
- ▶ ***Launch Date: February 2007***
- ▶ ***Launch Vehicle: Delta 2920H-10***
- ▶ ***Launch Site: KSC/Eastern Range***



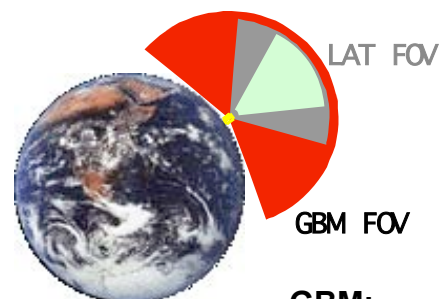
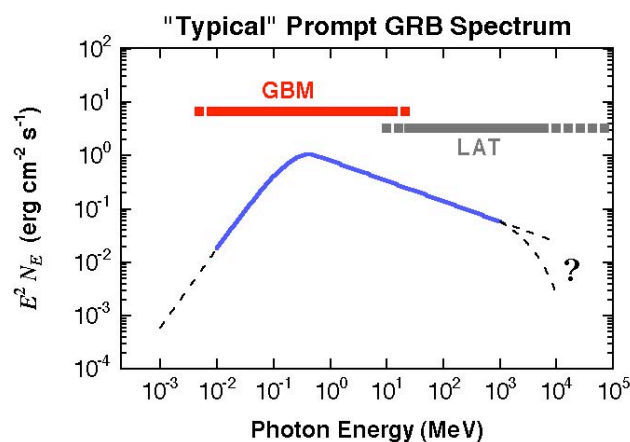
# Mission Elements





# Ops Concept - Science

- ▶ **Primary Science Instrument – LAT - Large Area Telescope**
  - *Developer: Stanford Linear Accelerator Center (SLAC)*
- ▶ **Secondary Science Instrument – GBM - GLAST Burst Monitor**
  - *Developer: MSFC/UAH and MPE Germany*



**LAT:**

**20 MeV – 300 GeV  $\pm 30^\circ$  FOV**

**GBM:**

**Nal Detector 5 KeV – 1 MeV**

**BGO Detector 150 KeV – 30 MeV**

**$\pm 120^\circ$  FOV**



# Ops Concept - Science

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- ▶ **Science Data Collected Continuously**
  - *Sky Survey, Pointed Observations and All Slews*
  - *Science Data and Instrument Housekeeping Store-and-Forward Operation*
- ▶ **Gamma Ray Burst Transient Detection**
  - *Both Instruments Detect Bursts (GBM Signals LAT with Trigger and Data)*
  - *7 second notification to ground based Gamma Ray Coordinates Network (GCN) for 80% of detected bursts*
- ▶ **Autonomous Acquisition of Gamma Ray Bursts**
  - *LAT evaluates repointing requests from GBM trigger and burst data*
  - *Subject to observatory health and safety considerations*
  - *Observatory capable of slewing 75 degrees in 10 minutes*
- ▶ **Accommodate Target of Opportunity (TOO) Repointing**
  - *Based on GLAST Science Support Center request uploaded through MOC*




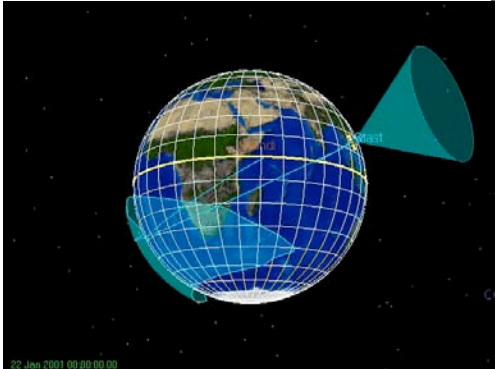
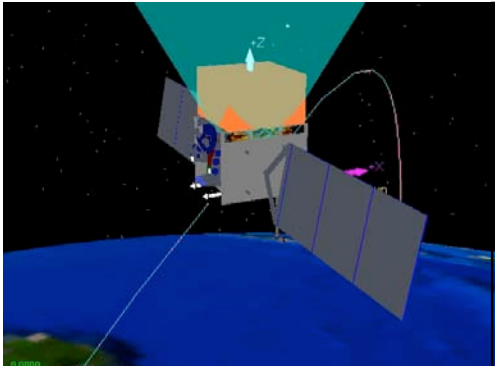
# Ops Concept

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- ▶ ***Mission Observation Profile:***
  - *First year all-sky survey scanning operations*
  - *Sky Survey or Pointed observations to any celestial target after first year*
  - *Autonomous repointing to Gamma Ray Bursts*
  
- ▶ ***Point anywhere, anytime with constraints***
  - *Earth Avoidance*
  - *Keep sun off LAT radiators*

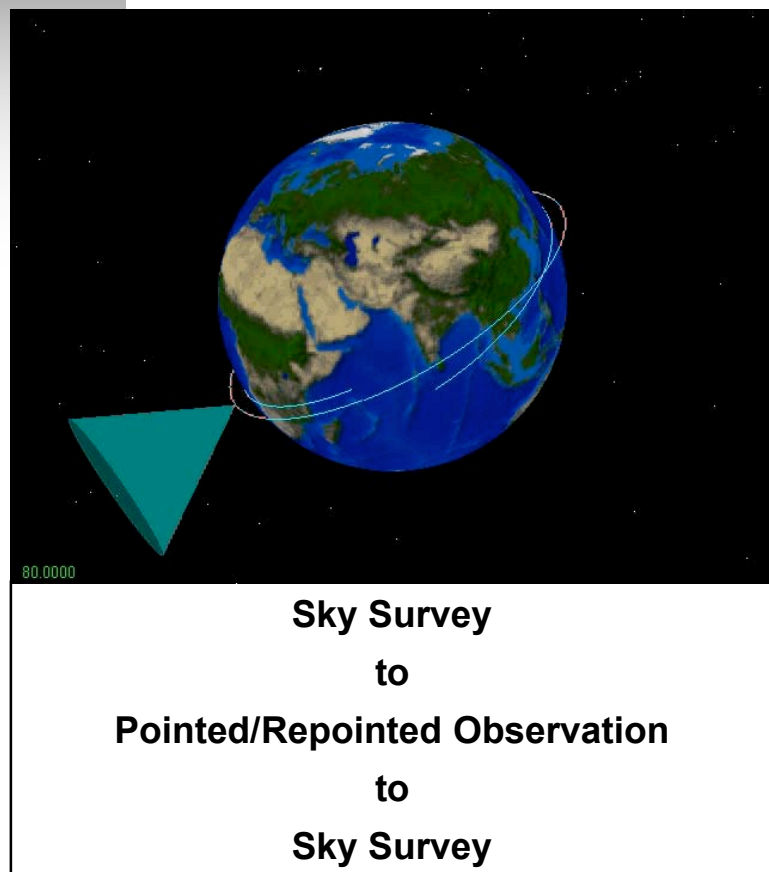


# Sky Survey Mode

 <p>1 Feb 2001 00:00:00.00</p>	<p>Sky Survey With 60° Rock</p>
 <p>22 Jan 2001 00:00:00.00</p>	<p>Sky Survey With 0° Rock</p>
 <p>0 0000</p>	<p>Sky Survey With 0° Rock</p>



# Pointed Mode

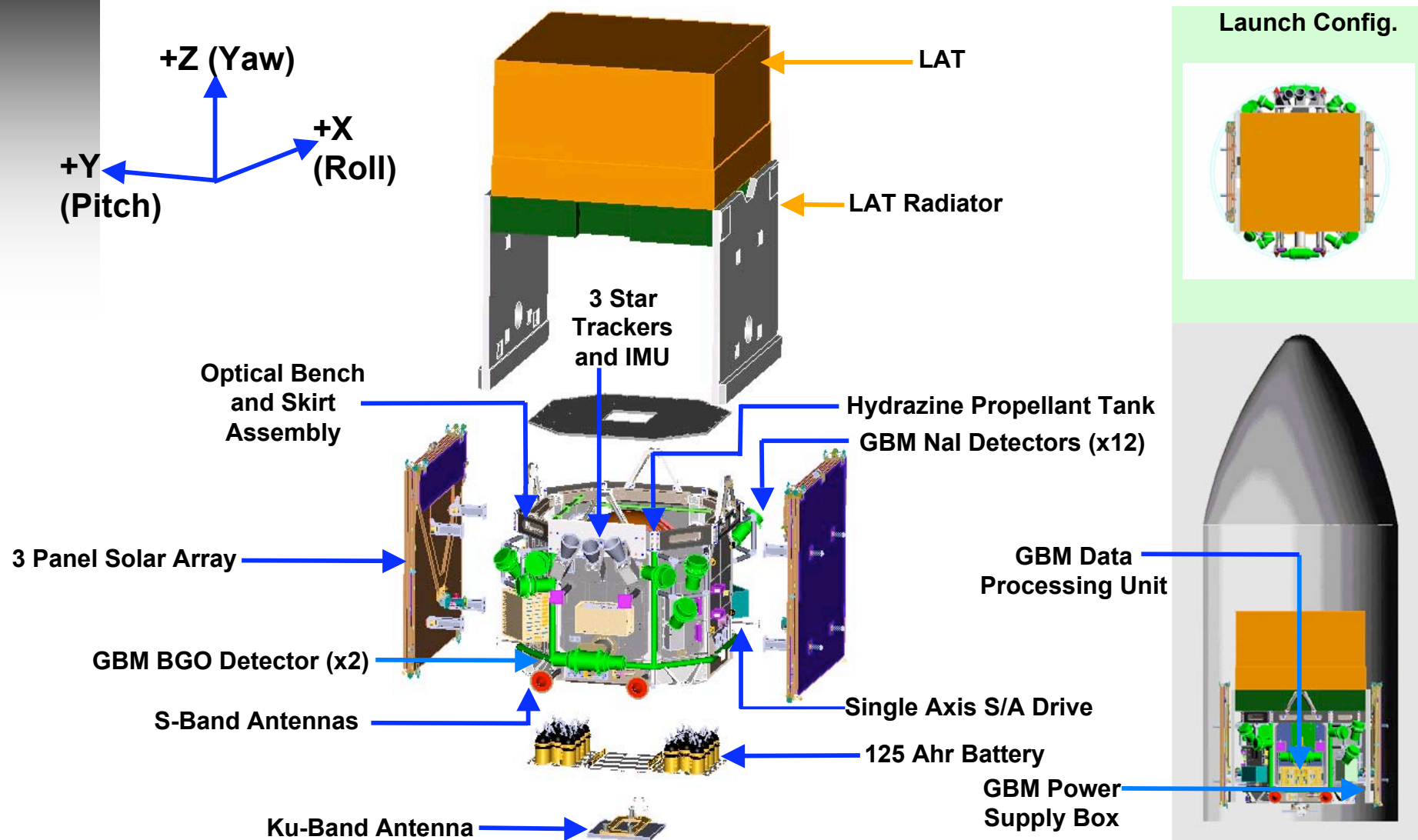


- ▶ ***Pointed Observation Mode by Ground Command as Part of Normal Operations***
- ▶ ***Repointed Observations In Response to Transient Events***
  - *Target of Opportunity (ToO) Commands From the Ground*
  - *Autonomous Repoint Requests (ARR) From LAT*
- ▶ ***Ground Changeable Repoint Time Initially Set to 5 Hours***



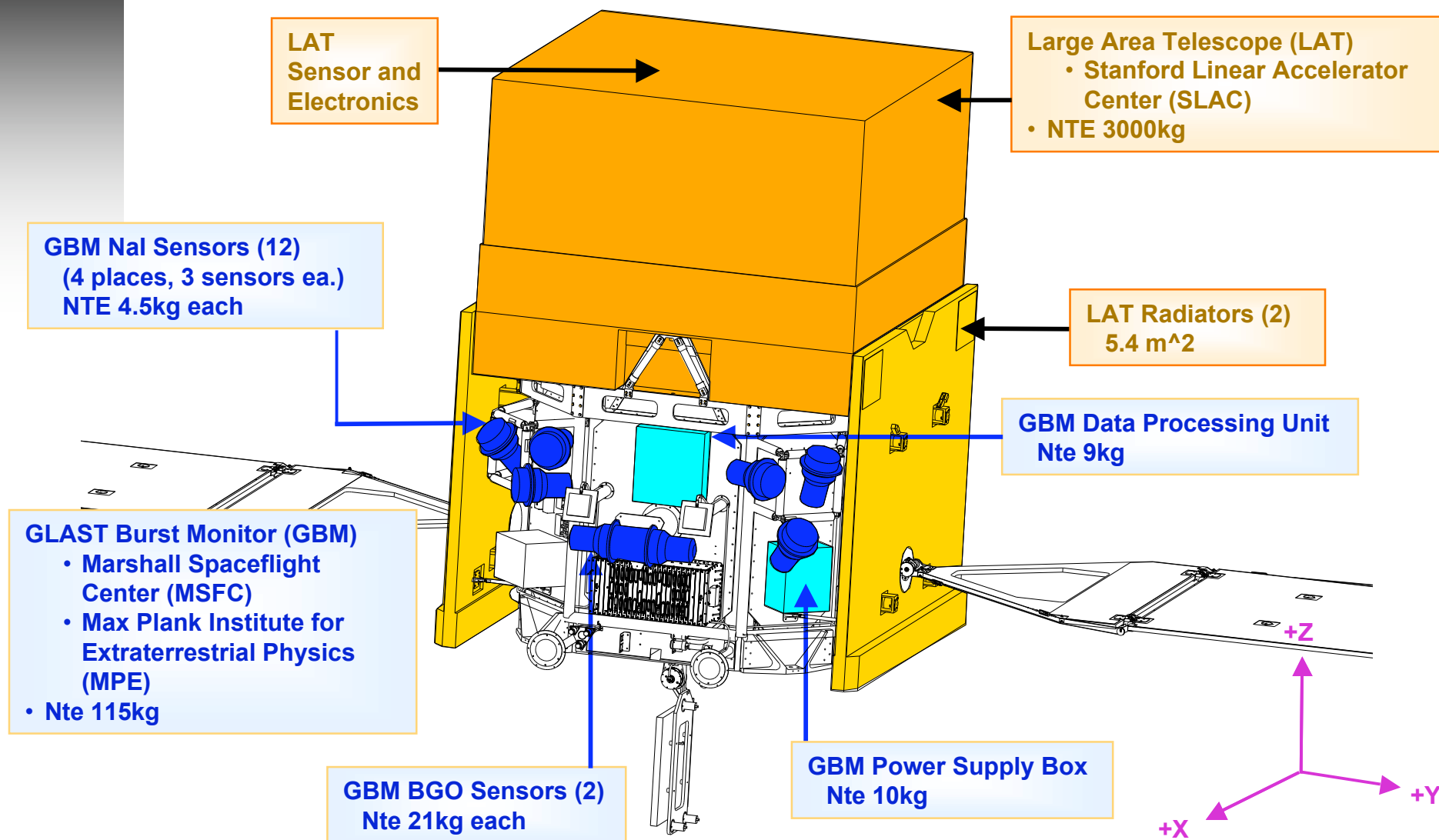


# Observatory Description - Expanded View



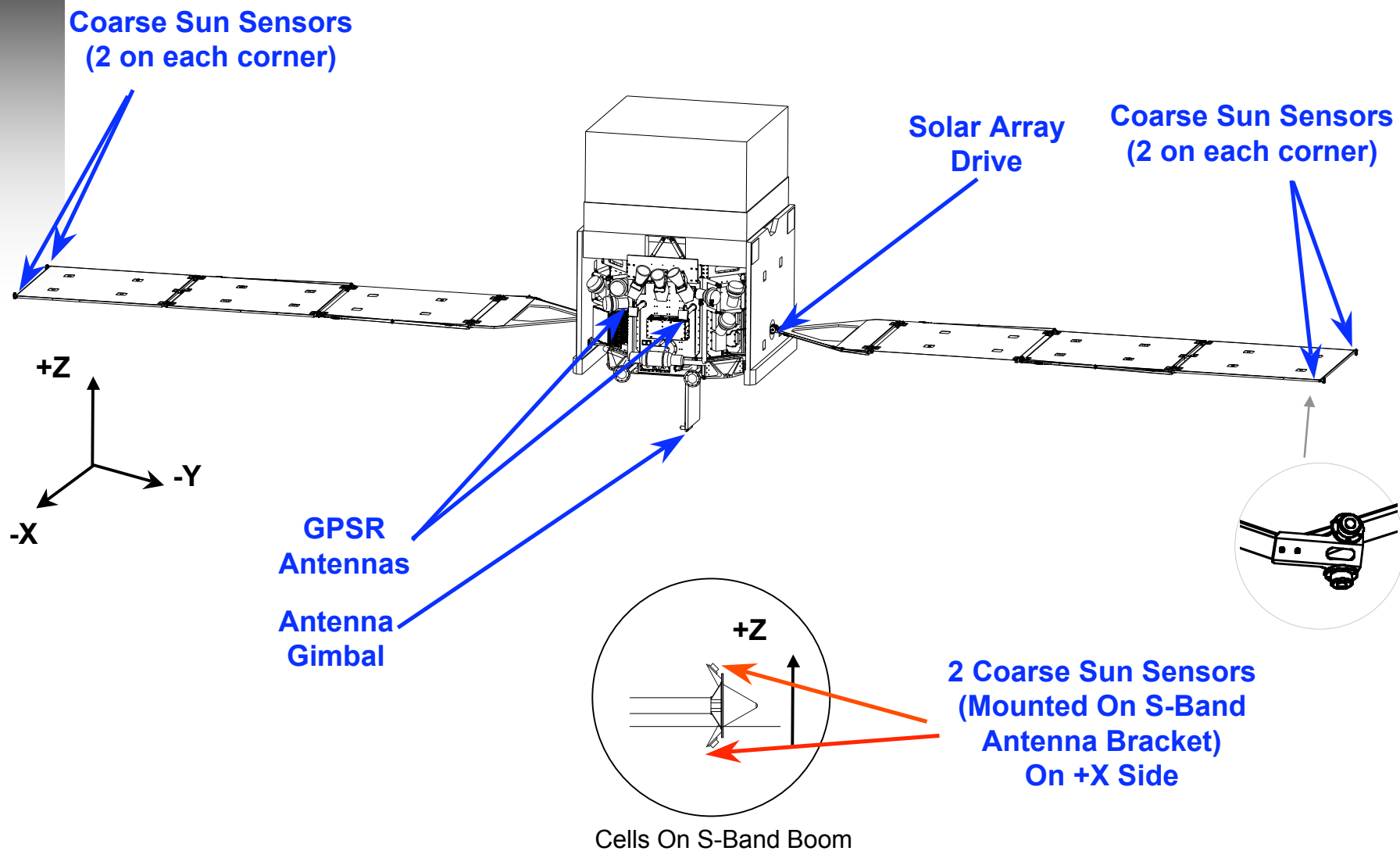


# Instrument Placements On Observatory





# Glast Baseline Configuration And Coordinate System





# Routine Operations Overview

## Routine Operations

- MOC Generated Schedules and Command Loads Define the Routine Mission (Nominal MOC Staffing is 8 x 5)
- GNC Calculates Position Relative to SAA, FSW Provides Notification to the LAT / GBM
- GPS Provides Time and Position Data to FSW and MOC for Operations

## Command Operations

- ATS / RTS Commands Used for Nominal Operations
- ATS Queues Loaded (Via S-Band Forward) Weekly
- Real-time Commands (Via S-Band Forward) Nominally Used for Contingency, Test, and Unique Operations

## SSR Operations

- SSR Stores >30 Hours of LAT/GBM Science Data, >36 Hours Obs HK and Diagnostic Data
- Downloaded at 40 Mbps Over TDRS Ku-Band
- 6+ Contacts Per Day Required (24/7 SN MA for Safemode or Burst Alerts)
- Selected SSR Areas Can Be Downloaded by the MOC

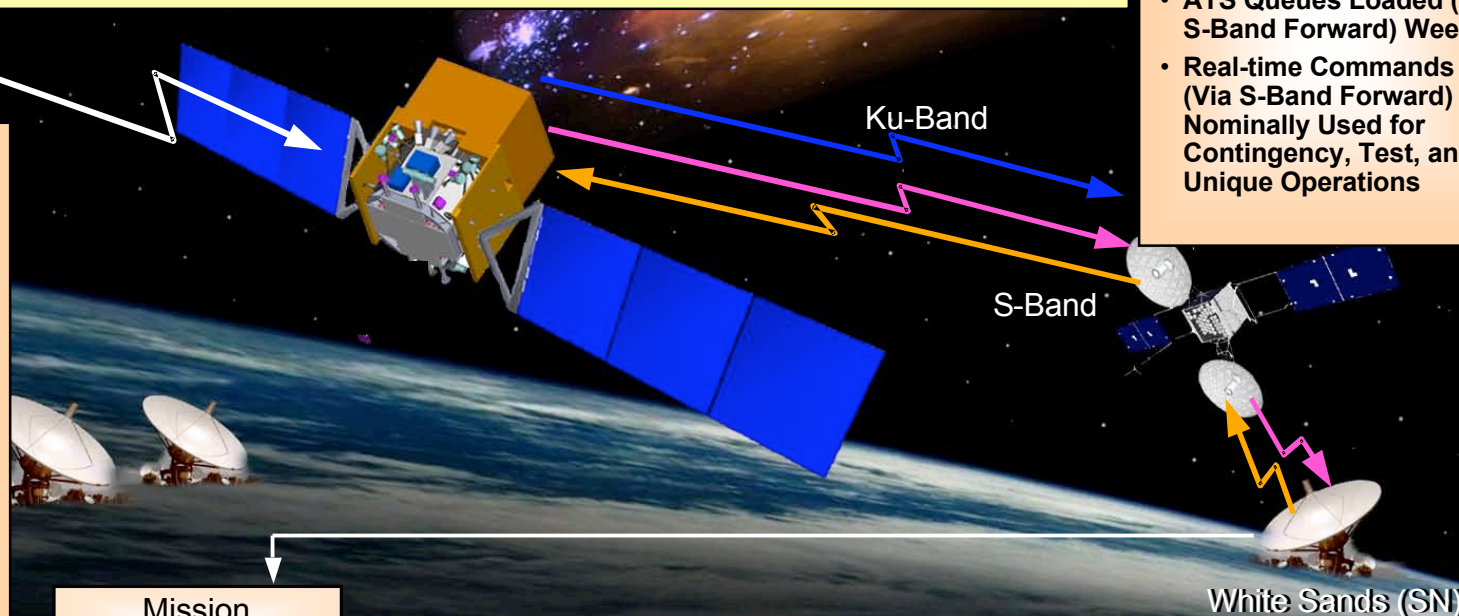
Mission  
Operations Center

## Science Modes

- MOC Commands the Instruments to the Proper Science Mode, Survey or Inertial Point (Planned Events) and Commands TOO's
- Observatory Notifies the MOC for Burst and LAT-Commanded Autonomous Re-pointing
- Observatory Resumes Planned Operations After Autonomous Re-point Completes (5 hr, Selectable Dwell)

## HK Operations

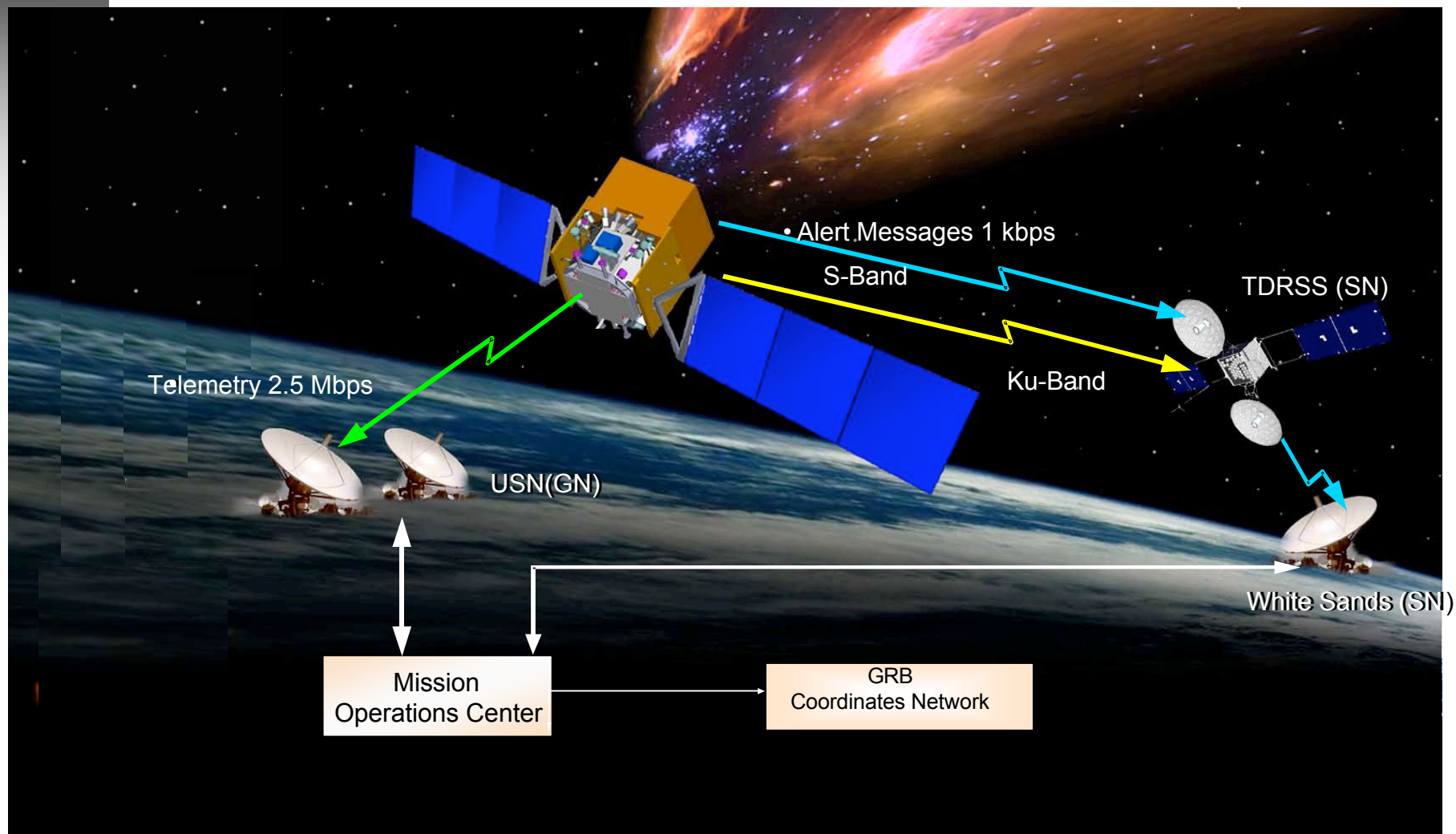
- 51 kbps RT Stream Contains Both SC and Instrument Housekeeping Data
- Data Stored on the SSR in Separate Partition From Science
- 51 kbps Is Part of the Ku-Band 40 Mbps Data Stream
- Stored HK Data Downlinked on Every Contact
- Data Used to Determine Observatory Health and Status
- Stored HK Data Provides Long Term Data for Trending and Analysis
- Diagnostic/Calibration Data Upon MOC Command







# Burst Alerts





# Mission Modes

<b><i>Mission Mode</i></b>	<b><i>Description</i></b>
<b><i>Launch</i></b>	<b><i>Configuration During Launch and Ascent. Essential Bus Powered ON. ESB Heaters Enabled.</i></b>
<b><i>Early Orbit</i></b>	<b><i>Deployment and Activation After Separation. Rate Nulling, Deploy Arrays, Acquire Sun, Maneuver to Sun Point and Wait for MOC.</i></b>
<b><i>Engineering</i></b>	<b><i>Used for Checkout, Instrument Cal, SW Uploads, and Safemode Transitions.</i></b>
<b><i>Sky Survey</i></b>	<b><i>Science Mode With Zenith Pointing and Yaw Steering. Includes Roll Rocking.</i></b>
<b><i>Pointed and Repointed</i></b>	<b><i>Science Mode to Point Anywhere, Anytime, for Any Duration With Autonomous Earth Avoidance. Repointed Supports Interrupts for TOOs or LAT Repoint Requests.</i></b>
<b><i>Safemode</i></b>	<b><i>Inertially Fixed, Known State for Observatory Anomaly Conditions. Nominal Safemode is OSM (Observatory Safemode).</i></b>
<b><i>Re-Entry</i></b>	<b><i>Used for Burn and Coast Periods of Controlled Re-Entry. No Science Available During this Phase</i></b>



# Mission Elements

